Case Docket No. KCC-2044

ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231 jc714 U.S. PTO
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Express Mail No.: EL456495935US
Date of Deposit: 15 March 2000

jc530 U.S. PTO
09/526037
03/15/00

Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): Kent Allan FRANKLIN et al.

For: SYSTEM FOR MEASURING AND CONTROLLING CUT LENGTH OF DISCRETE COMPONENTS IN A HIGH-SPEED PROCESS

Enclosed are:

- ☒ Ten (10) pages of specification, Eight (8) pages of claims (Claims 1-39), One (1) page of Abstract, and Two (2) sheets of drawings (Figs. 1-2).
- ☒ Executed combined Oath or Declaration, Power of Attorney and Petition (8 pages).
- ☒ Certificate of Mailing by Express Mail (2 pages).
- ☐ A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27.
- ☒ Recordation Form Cover Sheet, together with executed Assignment Document (6 pages) and a check in the amount of $40.00 to cover the recordal of Assignment fee.
- ☒ Information Disclosure Statement, together with Form PTO-1449 (3 pages) and with a copy of each and every cited reference.
- ☒ Return Receipt Postcard.

The filing fee has been calculated as shown below:

FOR:	COL. 1 NO. FILED	COL. 2 NO. EXTRA	SMALL ENTITY RATE	SMALL ENTITY FEE	OR	LARGE ENTITY RATE	LARGE ENTITY FEE
BASIC FEE				$380	OR		$690
TOTAL CLAIMS	39 less 20	19	X 09 =		OR	X 18 =	342
INDEPENDENT CLAIMS	3 less 3	0	X 39 =		OR	X 78 =	0
MULTIPLE DEPENDENT CLAIMS PRESENTED			+130=		OR	+260 =	
*** IF THE DIFFERENCE IN COL. 1 IS LESS THAN ZERO, ENTER "0" IN COL. 2**			**TOTAL**		**OR**	**TOTAL**	$1032

- ☒ A check in the amount of $1032.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 19-3550. A duplicate copy of this sheet is enclosed.
  - ☒ Any additional filing fees required under 37 CFR 1.16.
  - ☐ Any patent application processing fees under 37 CFR 1.17.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Kent Allan FRANKLIN Henry L. CARBONE David P. HUNTER Robert Lee POPP Gregory M. BLINCOE Christopher S. LARSEN
Title:	SYSTEM FOR MEASURING AND CONTROLLING CUT LENGTH OF DISCRETE COMPONENTS IN A HIGH-SPEED PROCESS
Express Mail No.:	EL456495935US
Date of Deposit:	15 March 2000

CERTIFICATE OF MAILING BY EXPRESS MAIL

Box PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

I hereby certify that the subject patent application is being deposited with the United States Postal Service as Express Mail Post Office to Addressee No. EL456495935US, on 15 March 2000, and is addressed to Box PATENT APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231, together with the items listed below.

- Transmittal Letter, in duplicate

Express Mail No.: EL456495935US

- Ten (10) pages of specification, Eight (8) pages of claims (Claims 1-39), One (1) page of Abstract, and Two (2) sheets of drawings (Figs.1-2)
- Executed combined Oath or Declaration, Power of Attorney and Petition (8 pages)
- Information Disclosure Statement, together with Form PTO-1449, three (3) pages, and with copies of each and every cited reference
- One (1) Recordation Form Cover Sheet, together with executed Assignment Document (6 pages) and a check in the amount of $40.00 to cover the recordal of Assignment fee
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Respectfully submitted,

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PATENT
Docket No.: KCC-14,899

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE:

SYSTEM FOR MEASURING AND CONTROLLING CUT LENGTH OF DISCRETE COMPONENTS IN A HIGH-SPEED PROCESS

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MAILED: 15 March 2000

SYSTEM FOR MEASURING AND CONTROLLING CUT LENGTH OF DISCRETE COMPONENTS IN A HIGH-SPEED PROCESS

FIELD OF THE INVENTION

This invention is directed to a closed-loop control system for controlling the cut length of a material. More specifically, the cut length is adjusted by changing feed roll speed or web tension.

BACKGROUND OF THE INVENTION

A number of different manufacturing processes are used to cut continuous webs of material, such as elastic material, including stretch bonded laminates, into discrete lengths prior to placement on a second continuous web. Such processes are typically carried out by open-loop control systems that change web tension through each roll of material to adjust for through-roll variations in cut length. A problem encountered with these types of systems is that they assume a consistent material property profile through each roll of material, thereby providing no means to control cut length if the material property profile through each roll of material is different. Also, no means are provided to maintain the web tension at a minimum to reduce cut length variation. Consequently, the higher cut length variation translates into higher material trim waste and poor quality product.

SUMMARY OF THE INVENTION

The present invention is directed to a closed-loop system that maintains a pre-set cut length of an elastic material, such as a stretch bonded laminate, as the material is cut and placed on a web, taking into account changes in the elastic

properties of the material. The system has the ability to measure the cut length, compare the average cut length to a target cut length, and to adjust web tension or feed roll speed to achieve the target cut length. Also, in a preferred embodiment of the system, the system is able to maintain the web tension at a minimum to reduce cut length variation, and adjust the feed roll speed to achieve the target cut length.

With the foregoing in mind, it is a feature and advantage of the invention to provide a process for controlling the cut length of a continuous material.

It is another feature and advantage of the invention to provide apparatus for controlling the cut length of a continuous material.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates schematically a preferred control system for reducing cut length variation of a continuous material; and

Fig. 2 illustrates schematically a preferred measurement detection device used in the control system of the present invention.

DEFINITIONS

"Elastic" and "Elasticity" refer to the tendency of a material, or composite material, to recover its original size and shape after removal of the force causing a deformation.

"Modulus of elasticity" refers to a constant that numerically measures or represents the amount of elasticity a material possesses.

"Operatively connected" means joining, attaching, connecting, or the like, of a first element and a second element either directly or indirectly by means of an additional element disposed between the first element and the second element.

"Stretch bonded laminate" refers to a composite material having at least two layers in which one layer is a gatherable layer and the other layer is an elastic layer. The layers are joined together when the elastic layer is in an extended condition so that upon relaxing the layers, the gatherable layer is gathered.

"Tension" refers to a force tending to cause the extension of a body, or the balancing force within that body resisting the extension.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

The present invention is directed to a system that reduces cut length variation by providing a closed-loop cut length control and a way to reduce web tension at a cut-off module. This system has the capability to adjust for changes in elastic material properties in through-roll and roll-to-roll applications. This system also allows higher web tension at an unwind end of the system which may be required to overcome roll blocking or idler inertia. Furthermore, short term cut length variation can be reduced by providing a way to minimize the tension of the web just prior to a material's entrance into a cut-off module from a driven roll.

This system is designed to measure and control cut lengths of discrete components in high-speed processes. More particularly, the system is applicable for machines running at speeds in excess of 300 products/min and can even be used with

machines running at speeds above 500 products/min. The maximum speed at which the system can be used is limited by the capability of the components used in the system.

Referring now to Fig. 1, there is schematically shown a preferred control system 20 of the present invention for reducing cut length variation in a continuous elastic material 22, including stretch bonded laminates. The system 20 includes an unwind spindle 24 from which the elastic material 22 is unwound and fed through the system 20. Once the elastic material 22 leaves the unwind spindle 24, the material travels around a plurality of rolls 26 to a first driving device 28, such as a driven roll. The first driving device 28 can be run at a speed greater than the speed of the unwind spindle 24, thereby resulting in relatively high tension which may be required to overcome roll blocking or idler inertia from the unwind spindle 24. High tension at the unwind spindle 24 may be required in both through-roll and roll-to-roll applications in order to overcome roll blocking or idler inertia.

Between the first driving device 28 and a second driving device 32, the material 22 is guided around a dancer roll 30 as a means to control the tension between the two driving devices 28, 32. Between the dancer roll 30 and the second driving device 32, the material 22 is guided around a couple of stationary rolls 31. After passing over the second driving device 32, the material 22 is directed around a tension measuring device 34, and the amount of tension in the material 22 is measured at that point. The material 22 then makes its way around a web guide 36, shown as

a two-part device, to a feed roll 38. The web guide 36 is used to control the positioning of the material 22 along a cross-direction of the process. For the purposes of the present invention, the cross-direction lies generally within the plane of the material 22 being transported through the process and is aligned perpendicular to the machine direction. The machine direction is indicated by arrows 40 in Fig. 1.

From the feed roll 38, the material 22 is fed into a cut-off module 42 where the material is cut into pieces 44 of discrete length. The cut-off module 42 includes a nip roll 41, an anvil roll 43, and one or more cutting mechanisms (e.g. blades 45) on either the nip roll 41 or the anvil roll 43 for cutting the elastic material 22 into pieces 44 of predetermined length. Once the material 22 is cut, the discrete length of the pieces 44 of the material is detected by a detection system 48 either on the anvil roll 43 or after the pieces 44 are transferred to a second web 46. The preferred location for the detection system 48 is as close to the cut-off module 42 as possible to minimize lag time in the system 20. A transfer device 50, or the anvil roll 43, can be used to transfer the pieces 44 from the cut-off module 42 to the second web 46. The transfer device 50 can be either a transfer roll or a conveyor. Similarly, the second web 46 can be either a web or a conveyor.

The detection system 48 may include a vision system or a photoeye. An example of a preferred detection system 48 is shown schematically in Fig. 2. The detection system 48 uses a sensor 52, such as a Banner R55C62QP Color Mark Sensor available from Banner Engineering Corp. of Minneapolis, Minnesota, to detect

the presence of each piece 44 on the anvil roll 43 immediately following the cut. Alternatively, as mentioned, the presence of each piece 44 can be detected while the piece 44 is either on the transfer device 50 or on the second web 46.

The sensor 52 produces a first type of signal, such as a “high” signal, when it detects the presence of the piece 44 and a second type of signal, such as a “low” signal, when it does not detect the presence of the piece 44. The first type of signal triggers an automatic registration and inspection system (ARIS) 54 to capture a starting count from a line shaft encoder 56. The second type of signal triggers ARIS 54 to capture an ending count from the line shaft encoder 56. ARIS 54 then determines the total number of encoder counts during which the sensor 52 detected the presence of each piece 44 and converts the number of encoder counts into an actual millimeter measurement representing the actual cut length of each piece 44.

A comparator 58 then compares the actual measurement to a target cut length. If the difference between the actual measurement and the target cut length is not equal to zero, the speed of the driving devices 28, 32 and/or the feed roll 38 and/or the unwind spindle 24 is increased or decreased through a proportional integral derivative (PID) control system 60 which is optimally tuned to achieve the target cut length. The PID 60 is operatively connected to the driving devices 28, 32 and/or the feed roll 38 and/or the unwind spindle 24, thereby having the capability to increase or decrease speed in view of the target cut length. The magnitude of the feed roll

speed changes depends on the tension of the elastic material 22 and the material properties of the elastic material.

In a preferred embodiment of the invention, the web tension immediately preceding the feed roll 38 is minimized to minimize cut length variation. In an alternative embodiment, the feed roll 38 can be maintained at a constant speed and the tension in the material 22 preceding the feed roll 38 can be changed by modulating the speeds of driving devices 32, 28 and/or the unwind spindle 24.

As product developers require materials with a lower modulus of elasticity, the challenge to minimize cut length variation will increase. The present invention provides a way to minimize tension into a cut-off module 42 and minimize cut length variation, even in lower modulus elastic materials.

EXAMPLES

The following examples were achieved using a Banner Photoeye looking at an anvil roll. A Banner R55C62QP Color Mark Sensor was used as input to ARIS for these trials. Measurements from both a camera and the Photoeye were made to samples of a stretch bonded laminate material, having a relaxed thickness of approximately 0.053 inches (0.13 cm) and an approximate basis weight of 3.047 ounces per square yard, after the material passed through a cut-off module. The samples were collected for approximately one minute each. An electronic datalog function was used to collect the calculated cut length measurement results from ARIS.

The initial cut length setting used was 84 mm per product. Product was collected after it passed through the cut-off module and was manually measured and recorded. Four sample sets were collected and analyzed. The data below shows that panels in process could be accurately measured within approximately 1 mm.

Example 1:

No change to cut length setting - cut length was set at ~84 mm per product.

ARIS Measurements (500 products): AVG = 83.9 mm STD = 0.98 mm

Manual Measurement (18 products): AVG = 83.3 mm STD = 0.69 mm

Example 2:

Cut length setting was increased by 2 mm/product to ~86 mm/product.

ARIS Measurements (500 products): AVG = 85.8 mm STD = 0.85 mm

Manual Measurement (18 products): AVG = 86.1 mm STD = 0.94 mm

Example 3:

Cut length setting was increased another 2 mm/product to ~88 mm/product.

ARIS Measurements (500 products): AVG = 87.8 mm STD = 0.81 mm

Manual Measurement (18 products): AVG = 88.2 mm STD = 0.71 mm

Example 4:

Cut length setting was decreased by 4 mm/product from original to ~80 mm/product.

ARIS Measurements (500 products): AVG = 80.3 mm STD = 0.83 mm

Manual Measurement (18 products): AVG = 80.6 mm STD = 0.62 mm

It will be appreciated that details of the foregoing embodiments, given for purposes of illustration, are not to be construed as limiting the scope of this invention. Although only a few exemplary embodiments of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention, which is defined in the following claims and all equivalents thereto. Further, it is recognized that many embodiments may be conceived that do not achieve all of the advantages of some embodiments, particularly of the preferred embodiments, yet the absence of a particular advantage shall not be construed to necessarily mean that such an embodiment is outside the scope of the present invention.

WE CLAIM:

1. A process for cutting a material into pieces having a predetermined target length, comprising the steps of:

feeding a continuous web of the material from a feed roll to a cut-off module;

measuring tension in the web;

cutting a piece of the material from the continuous web;

measuring an actual length of the piece of material;

comparing the actual length of the piece of material to the target length; and

adjusting the tension in the web prior to the web encountering the feed roll in response to any difference between the actual length and the target length.

2. The process of Claim 1 further comprising the step of placing the piece of material on a second web of material.

3. The process of Claim 2 wherein the actual length of the piece of material is measured prior to the piece's placement on the second web.

4. The process of Claim 2 wherein the actual length of the piece of material is measured after the piece is placed on the second web.

5. The process of Claim 1 further comprising the step of placing the piece of material on a conveyor.

6. The process of Claim 5 wherein the actual length of the piece of material is measured prior to the piece's placement on the conveyor.

7. The process of Claim 5 wherein the actual length of the piece of material is measured after the piece is placed on the conveyor.

8. The process of Claim 1 wherein the tension in the web is measured prior to the web encountering the feed roll.

9. The process of Claim 1 wherein the tension in the web is measured between the feed roll and the cut-off module.

10. The process of Claim 1 wherein the step of measuring the actual length includes producing a first signal when the piece is sensed, and producing a second signal when the piece is not sensed.

11. The process of Claim 10 wherein the first signal triggers a device to capture a starting count and the second signal triggers the device to capture an ending count.

12. The process of Claim 11 wherein the device determines a total number of encoder counts and converts the number of encoder counts into the actual length.

13. The process of Claim 12 wherein a non-zero difference between the actual length and the target length triggers the tension adjusting step.

14. The process of Claim 1 wherein the tension-adjusting step includes the step of modulating the web tension to a minimum.

15. A process for cutting a material into pieces having a predetermined target length, comprising the steps of:

feeding a continuous web of the material from a feed roll to a cut-off module;

measuring tension in the web prior to the web encountering the feed roll;

cutting a piece of the material from the continuous web;

measuring an actual length of the piece of material;

comparing the actual length of the piece of material to the target length; and

adjusting the feed roll's speed in response to any difference between the actual length and the target length.

16. The process of Claim 15, further comprising the step of maintaining the web tension at a minimum immediately preceding the feed roll.

17. The process of Claim 15 further comprising the step of placing the piece of material on a second web of material.

18. The process of Claim 17 wherein the actual length of the piece of material is measured prior to the piece's placement on the second web.

19. The process of Claim 17 wherein the actual length of the piece of material is measured after the piece is placed on the second web.

20. The process of Claim 15 further comprising the step of placing the piece of material on a conveyor.

21. The process of Claim 20 wherein the actual length of the piece of material is measured prior to the piece's placement on the conveyor.

22. The process of Claim 20 wherein the actual length of the piece of material is measured after the piece is placed on the conveyor.

23. The process of Claim 15 wherein the step of measuring the actual length includes producing a first signal when the piece is sensed, and producing a second signal when the piece is not sensed.

24. The process of Claim 23 wherein the first signal triggers a device to capture a starting count and the second signal triggers the device to capture an ending count.

25. The process of Claim 24 wherein the device determines a total number of encoder counts and converts the number of encoder counts into the actual length.

26. The process of Claim 25 wherein a non-zero difference between the actual length and the target length triggers the feed roll speed adjusting step.

27. Apparatus for producing discrete pieces of material of a target cut length, the apparatus comprising:

an unwind spindle from which a continuous web of material is fed;

a cut-off module, wherein a discrete piece of material is cut from the continuous web;

a feed roll between the unwind spindle and the cut-off module;

a device for measuring tension in the web; and

a detection system for measuring an actual length of the discrete piece of material.

28. The apparatus of Claim 27 wherein the feed roll has an adjustable speed.

29. The apparatus of Claim 27 wherein a level of tension in the continuous web at the unwind spindle is higher than a level of tension in the continuous web at the cut-off module.

30. The apparatus of Claim 27 further comprising a dancer roll between the unwind spindle and the feed roll.

31. The apparatus of Claim 30 further comprising a web guide between the dancer roll and the feed roll.

32. The apparatus of Claim 27 further comprising a transfer device between the cut-off module and a second web of material.

33. The apparatus of Claim 27 further comprising a transfer device between the cut-off module and a conveyor.

34. The apparatus of Claim 27 wherein the detection system comprises an automatic registration and inspection system and a line shaft encoder.

35. The apparatus of Claim 27 further comprising a proportional integral derivative control system operatively attached to the feed roll.

36. The apparatus of Claim 27 further comprising a proportional integral derivative control system operatively attached to the unwind spindle.

37. The apparatus of Claim 27 further comprising at least one driving device between the unwind spindle and the feed roll, wherein the at least one driving device is operatively attached to a proportional integral derivative control system.

38. The apparatus of Claim 27 wherein the device for measuring tension in the web measures tension in the web between the unwind spindle and the feed roll.

39. The apparatus of Claim 27 wherein the device for measuring tension in the web measures tension in the web between the feed roll and the cut-off module.

ABSTRACT OF THE DISCLOSURE

A closed-loop system can maintain a pre-set cut length of a material as the material is cut and placed on a web. The system has the ability to measure the actual cut length, compare the average actual cut length to a target cut length, and to adjust web tension or feed roll speed to achieve the target cut length. Actual cut length variation is thereby reduced. Furthermore, short term cut length variation is further reduced by minimizing the tension of the web just prior to the material being cut.

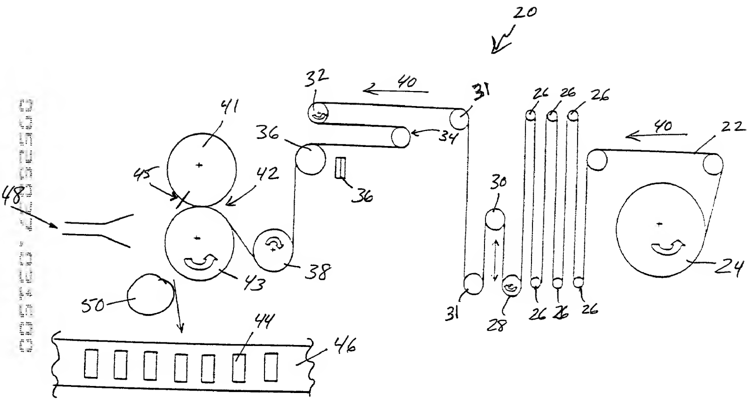
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Fig. 1

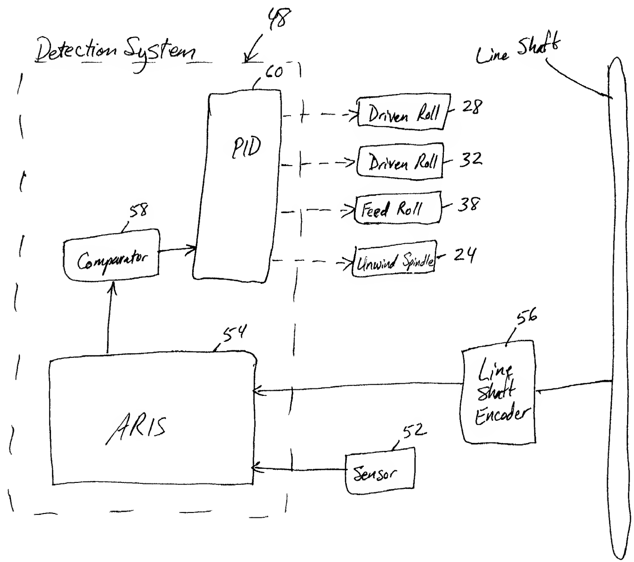

Fig. 2

09525037.031500

Docket No.: KCC-14,899

COMBINED DECLARATION, POWER OF ATTORNEY AND PETITION

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declare that we have reviewed and understand the contents of the attached specification and claims and we verily believe that we are the original, first and joint inventors or discoverers of the invention or discovery in

SYSTEM FOR MEASURING AND CONTROLLING CUT LENGTH OF DISCRETE COMPONENTS IN A HIGH-SPEED PROCESS

described and claimed in the attached specification; that we do not know and do not believe that this invention was ever known or used in the United States before our invention or discovery thereof; that to the best of our knowledge and belief the invention has not been in public use or on sale in the United States more than one year prior to our application, or patented or made the subject of an inventors' certificate in any foreign country prior to the date of our application on an application filed by ourselves or our legal representatives or assigns more than twelve months prior to our application in this country; that we acknowledge our duty to disclose information of which we are aware which is material to the examination of this application in accordance with 37 C.F.R. 1.56(a); and that no application for patent or inventors' certificate on this invention or discovery has been filed by us or our legal representatives or assigns in any country foreign to the United States, except as follows:

None

POWER OF ATTORNEY

We hereby appoint the following attorneys to prosecute this application and transact all business in the United States Patent and Trademark Office connected therewith:

Patricia A. Charlier	Reg. No. 38,840	Thomas M. Parker	Reg. No. 42,062
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PETITION

Wherefore we Pray that Letters Patent be granted to us for the invention or discovery described and claimed in the attached specification and claims, and we hereby subscribe our names to the attached specification and claims, Declaration, Power of Attorney and this Petition.

DECLARATION

The undersigned further declare that all statements made herein of their knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date	Kent Allan FRANKLIN
Date	Henry L. CARBONE
Date	David P. HUNTER
Date	Robert Lee POPP
Date	Gregory M. BLINCOE
03/13/00 Date	Christopher S Larsen Christopher S. LARSEN

Docket No.: KCC-14,899

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	Citizenship:	United States of America

declare that we have reviewed and understand the contents of the attached specification and claims and we verily believe that we are the original, first and joint inventors or discoverers of the invention or discovery in

SYSTEM FOR MEASURING AND CONTROLLING CUT LENGTH OF DISCRETE COMPONENTS IN A HIGH-SPEED PROCESS

described and claimed in the attached specification; that we do not know and do not believe that this invention was ever known or used in the United States before our invention or discovery thereof; that to the best of our knowledge and belief the invention has not been in public use or on sale in the United States more than one year prior to our application, or patented or made the subject of an inventors' certificate in any foreign country prior to the date of our application on an application filed by ourselves or our legal representatives or assigns more than twelve months prior to our application in this country; that we acknowledge our duty to disclose information of which we are aware which is material to the examination of this application in accordance with 37 C.F.R. 1.56(a); and that no application for patent or inventors' certificate on this invention or discovery has been filed by us or our legal representatives or assigns in any country foreign to the United States, except as follows:

None

POWER OF ATTORNEY

We hereby appoint the following attorneys to prosecute this application and transact all business in the United States Patent and Trademark Office connected therewith:

Patricia A. Charlier	Reg. No. 38,840	Thomas M. Parker	Reg. No. 42,062
Thomas J. Connelly	Reg. No. 28,404	Brian C. Pauls	Reg. No. 40,122
Gregory E. Croft	Reg. No. 27,542	Sebastian C. Pugliese III	Reg. No. 42,091
Jeffrey B. Curtin	Reg. No. 37,601	James B. Robinson	Reg. No. 34,912
Jeremiah J. Duggan	Reg. No. 24,470	Karl V. Sidor	Reg. No. 32,597
Steven D. Flack	Reg. No. 40,608	Douglas H. Tulley	Reg. No. 34,743
Thomas M. Gage	Reg. No. 33,385	Patrick C. Wilson	Reg. No. 31,893
Joseph P. Harps	Reg. No. 28,854	Paul Y. Yee	Reg. No. 29,460
William D. Herrick	Reg. No. 25,468	Thomas W. Speckman	Reg. No. 22,617
Kyle K. Kappes	Reg. No. 34,864	Douglas H. Pauley	Reg. No. 33,295
John P. Kirby, Jr.	Reg. No. 25,348	Maxwell J. Petersen	Reg. No. 32,772
Nancy M. Klembus	Reg. No. 40,051	Mark E. Fejer	Reg. No. 34,817
Nicholas N. Leach	Reg. No. 31,776	Charles C. Kinne	Reg. No. 31,631
Thomas J. Mielke	Reg. No. 31,399	Nick C. Kottis	Reg. No. 31,974
Douglas L. Miller	Reg. No. 30,406	Kevin D. Erickson	Reg. No. 38,736
Lisa J. Moyles	Reg. No. 40,737	Roland W. Norris	Reg. No. 32,799
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PETITION

Wherefore we Pray that Letters Patent be granted to us for the invention or discovery described and claimed in the attached specification and claims, and we hereby subscribe our names to the attached specification and claims, Declaration, Power of Attorney and this Petition.

DECLARATION

The undersigned further declare that all statements made herein of their knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

March 14, 2000
Date

Kent Allan FRANKLIN

March 13, 2000
Date

Henry L. CARBONE

March 13, 2000
Date

David P. HUNTER

March 13, 2000
Date

Robert Lee POPP

March 13, 2000 March 13, 2000
Date

Gregory M. BLINCOE

Date

Christopher S. LARSEN